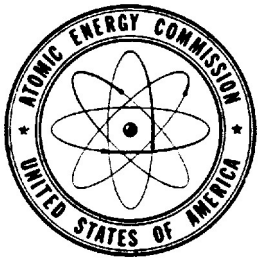
UNITED STATES ATOMIC ENERGY COMMISSION

Twenty-third Semiannual Report

OF THE

ATOMIC ENERGY COMMISSION



January 1958

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LETTER OF SUBMITTAL

WASHINGTON, D. C.,
31 January 1958.

SIRS: We have the honor to submit herewith the Twenty-third Semi-annual Report of the United States Atomic Energy Commission, as required by the Atomic Energy Act of 1954.

Respectfully,

UNITED STATES ATOMIC ENERGY COMMISSION,
JOHN F. FLOBERG.*
JOHN S. GRAHAM.*
WILLARD F. LIBBY.
HAROLD S. VANCE.
LEWIS L. STRAUSS, *Chairman.*

The Honorable
The President of the Senate.

The Honorable
The Speaker of the House of Representatives.

*Commissioners Floberg and Graham took office on October 1 and September 12, 1957, respectively, and therefore were not serving for the period of this report preceding those dates.

Production of Special Nuclear Materials

Production rates of the various special nuclear materials for the last 6 months of 1957, the period covered by this report, equaled or exceeded the established goals. Production facilities operated satisfactorily, and all scheduled requirements for the military and civilian programs were met.

Heavy Water

In accordance with announcement made on December 4, 1956, that Commission needs no longer required operation of two heavy-water plants, production at the Dana, Ind., plant was reduced gradually and operations were discontinued on May 24, 1957. Work involved in placing the plant in standby condition was completed August 23, and the Commission's Dana Area Office was closed November 1.

Heavy water continues to be produced at a reduced rate at Savannah River, S. C.

Feed Construction

Construction of the feed materials production center at Weldon Spring, Mo., continued on schedule during this reporting period. The refinery, which began startup operation in May, now is operating above design rates. Construction of the laboratory was completed on August 23.

Operation of the feed plant at Portsmouth, Ohio, was scheduled for early next year.

New Production Reactor

After reviewing alternative concepts for a plutonium-producing reactor, the Commission assigned responsibility for design and development work on a new large-scale reactor to General Electric Co. at Hanford, Wash. Considerable information needed for the reactor's engineering design has been developed at Hanford as part of the continuing research and development program there.

A contract for preliminary design of supporting facilities required for operation of the reactor was awarded on November 5 to the firm of Burns & Roe, of New York.

Military Applications

During the July–December period of this report, emphasis continued on research and on development activities designed to improve and increase the United States arsenal of nuclear weapons. Tests were conducted. Development programs continued on small weapons which can be used for defensive purposes, and on weapons so designed as greatly to reduce the radioactivity remaining after detonation.

In accordance with Presidential direction, production continued on a variety of nuclear weapons, including particularly weapons designed for defense against attack.

Weapons Testing

Operation Plumbbob

The Nevada Test Organization detonated 24 nuclear devices and conducted 6 safety experiments at the Nevada Test Site near Las Vegas, Nev., in support of the programs of the Commission, the Department of Defense, and the Federal Civil Defense Administration. The operational period of the series, known as *Plumbbob*, extended from March 15 through October 12.

The tests were held to attain new knowledge important to the defense of the United States and the free world, with a major objective of further developing defensive weapons. Studies of weapons effects were conducted to improve military and civil defense against nuclear attack. Biomedical research programs included expanded projects for evaluating the immediate and the delayed effects of radioactive fallout (see section on Biology and Medicine, following). Some tests contributed to studies on weapons producing greatly reduced residual radioactivity.

Ten tests of full-scale nuclear devices were of primary interest to the weapons development program of Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Twelve tests were of primary interest to the development program of the University of California Radiation Laboratory branch at Livermore, Calif. Two, utilizing Los Alamos devices, were of primary interest to the Department of Defense. One of these was a major study of effects from a relatively low aerial burst of a device suspended from a balloon, and the other was a test of effects from a high-altitude airburst of a nuclear warhead in an air-to-air rocket which was launched by an Air Force plane and detonated at a point in space.

Of the 6 safety experiments, 5 were of Los Alamos devices and one was of a Livermore device, all the tests being related to safe handling and storage of nuclear weapons. Two safety experiments at the

Nevada Test Site were conducted in December by Los Alamos Scientific Laboratory. They were similar to the six experiments conducted earlier as part of Operation *Plumbbob* in order to determine the safety of nuclear weapons in handling and storage.

In the original series of safety tests, 3 were positioned on the surface of the earth, 1 was in a horizontal tunnel dug into a mesa, and 2 were in vertical shafts drilled deep into the earth.

New test methods. Two new methods of placing full-scale nuclear devices for tests—suspended from a balloon and deep underground—were considered satisfactory in application. The use of captive balloons to lift the experimental device to an altitude sufficient to prevent the detonation fireball from reaching the ground appreciably reduced local fallout of radioactive materials. Thirteen of the full-scale nuclear tests utilized this method, and none resulted in significant fallout in the test region.

In the second method, a tunnel was dug horizontally into a mesa and at its end was bent in almost a complete circle. A device of known low yield was placed in the chamber at the tunnel's end. This was done so that the detonation would seal off the nearby main tunnel with rocks before radiation products could escape. The experiment's objective of containing all radiation was achieved.

Both these methods involved developing new instrumentation to obtain diagnostic and effects data. Both proved successful and can replace tower detonations in many, but not all, future tests on the continent.

Features of tests. Most *Plumbbob* tests were used by the Armed Forces for orientation of personnel and for training. One test was used by the Marine Corps for a vertical envelopment troop exercise, and another was used by the Army to test its new pentomic organization of divisions and to test the use of helicopters in tactical situations.

Eleven shots were observed by news representatives of the United States, as well as by Federal, State, and local officials, and personnel of other Federal agencies concerned with civil defense as the guests of the Federal Civil Defense Administration. Through arrangements coordinated by the State Department, newsmen representing newspapers of other countries of the Free World which have special defense arrangements with the United States were invited to view these shots, and 21 foreign newsmen observed four of the detonations.

A small number of analyses and experiments was undertaken during Operation *Plumbbob* in connection with the Fireball Chemistry Project established to study ways and means of reducing the accessibility of fallout radiostrontium to the biosphere and in particular to the human body.

Silica sand was added to the fireball of certain test shots and samples of fallout debris were analyzed for solubility. Fallout debris from previous tests in which large amounts of steel and aluminum were present in the fireball also were analyzed for solubility. Laboratory studies are being conducted to determine the relative capacity of a wide variety of materials to capture strontium 90 under conditions simulating those of a cooling and condensing fireball. Further experiments on this project are planned for the 1958 test series at Eniwetok Proving Ground.

Peaceful Uses of Weapons

A program of investigation into the possible nonmilitary uses of nuclear explosive devices, known as "Project Plowshare," was established at the University of California Radiation Laboratory at Livermore in July 1957. At present, primary emphasis is being given to the potential excavation application.

The underground test held at the Nevada Test Site, September 19, to determine the feasibility of underground testing is expected to provide information which will be of interest to this project. Drilling and investigation of the underground shot was continuing in December.

Testing Activities at Tonopah

Sandia Laboratory continued its utilization of the Tonopah Ballistics Range, activated in the spring of 1957, to determine the ballistic characteristics of inert weapons shapes dropped from high-speed aircraft.

Sandia also began in July a series of rocket tests intended to develop equipment, instrumentation, and procedures for high-altitude research. Rocket firings were held periodically throughout the 6 months.

1958 Tests at Eniwetok

In the absence of a safeguarded disarmament agreement, preparations are underway by the Atomic Energy Commission and the Department of Defense for a series of nuclear tests to begin in April 1958 at the Eniwetok Proving Ground in the Pacific. The United States repeatedly has stated its willingness to suspend nuclear tests as part of disarmament agreement. Until such an agreement is attained, continued development of nuclear weapons is essential to the defense of the United States and of the free world. The test series was announced on September 15.

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[1] See p. 10, Twenty-first

The forthcoming series will advance the development of weapons for defense against aggression whether airborne, missile-borne, or otherwise mounted. Information on the effects of weapons will be obtained for military and civilian defense use. Test operations will be governed by the declaration made in the Bermuda comminuqué on March 24, 1957, of the intention of the United States "to conduct nuclear tests only in such manner as will keep world radiation from rising to more than a small fraction of the levels that might be hazardous."

An important objective of the tests will be the further development of nuclear weapons with greatly reduced radioactive fallout so that radiation hazard may be restricted to the military target. This principle was first proved in the Pacific test series of 1956.

As in the past series, a control area surrounding the proving ground will be established to safeguard air and sea traffic and will be defined well in advance of the commencement of operations.

Weapons Facilities

The previously reported expansion of weapons production facilities—at the Rocky Flats plant near Denver, Colo., at the Iowa Ordnance Plant at Burlington, Iowa, and at the Pantex Ordnance Plant near Amarillo, Tex.—were essentially completed and the expanded facilities were put into operation.

The plant located at Buffalo, N. Y., operated by ACF Industries, Inc., has been closed as a production facility. The work formerly done at Buffalo will be performed in other plants. Because of the termination of this contract, the Buffalo Area Office will be closed.

A Clearwater Area Office was established to administer a contract for production of electronic equipment at the Pinellas Peninsula Plant, near Clearwater, Fla., after February 1958. The plant is currently operated by General Electric Co. under a subcontract with the Sandia Corp., prime contractor under the Albuquerque Operations Office.

Biology and Medicine

The Commission expanded its surveys and studies of radioactive fallout from weapons tests during the last 6 months, and describes the work in this report. The Commission also describes the precautions taken to protect residents near the Nevada Test Site and the population generally during the spring and summer series of weapons tests, and includes a table of radiation exposures at 138 localities mostly in Nevada and Utah, but also in Arizona and California.

[1] See p. 10, Twenty-first Semiannual Report to Congress (July–December 1956).

This section also reports highlights of preliminary data from weapons tests in which studies of effects from atomic explosions were studied from the standpoint of civil defense.

Construction of the Brookhaven Medical Research Center at Brookhaven National Laboratory, Upton, Long Island, N. Y., progressed with the hospital building and laboratory essentially complete and the reactor wing 75 percent complete. Acceptance testing of the control rod drive has been completed. Fuel element fabrication will be started in February by Sylvania-Dow-Corning, Inc., Bayside, Long Island.

The Commission revised its standards on permissible levels for long-time exposure to radiation.

Plumbbob Precautions and Measurements

The precautions taken to protect people and property in areas near the Nevada Test Site and the general population from adverse effects of Operation Plumbbob were essentially those described in earlier reports.[2] Further improvements were undertaken.

During Operation Plumbbob, the test organization postponed test shots on 76 different occasions because weather conditions were unfavorable for providing maximum protection to inhabited areas from the effects of the detonations. Four postponements were ordered because of predictions that the damage from blast might result—the first time that Nevada shots have been postponed because of forecasts of possible blast damage.

The Commission reviews the precautionary methods in the following pages and gives details on some aspects of the safeguards employed.

Measures Taken To Protect the Public

The Nevada Test Site, an area of about 600 square miles, is located in southwestern Nevada adjacent to an Air Force gunnery range of 4,000 square miles. It is surrounded chiefly by areas which are sparsely populated and this in itself is a major safeguard. The test site was closed to the public. Before a detonation, special surveys from the air assured that no persons had wandered into the area, and test shots were publicly announced in advance. As reported in the section on military applications, steps were taken to reduce fallout by firing devices from high towers and balloons. One nuclear detonation was fired deep underground to eliminate fallout completely.

Following each detonation, aircraft from the test organization

[2] See pp. 207–215, Twenty-first Semiannual Report (July–December 1956), for detailed discussion of the subject.

tracked the cloud of radioactive material until radioactive decay or dispersion made it no longer readily detectable.

Another safeguard was provided by an advisory panel of experts in the fields of biology, medicine, blast, fallout prediction, and meteorology which weighed all factors involving public safety before each nuclear detonation. An adverse decision by this panel would result in canceling any shot.

A large Weather Prediction Unit functioned at the Nevada Test Site. The Air Weather Service of the Air Force had approximately 100 men assigned to primary support duty. They manned 10 weather stations set up for the Nevada tests, and also provided an average of 3 weather flight missions off the Pacific coast every 2 days. These proved invaluable in predicting air movements in the test area.

The U. S. Weather Bureau, in addition to providing to the prediction unit nearly a dozen highly trained forecasters and technicians, maintained an extra weather observation site for the test period and performed special observations.

Weather forecasts of changes that might preclude the firing of a shot were obtained up to 1 hour before the shot. About 2 hours prior to each scheduled shot, local conditions were checked by balloon runs in the firing area to verify that high-altitude winds were conforming to forecast patterns and speeds.

The Fallout Prediction Unit was comprised of 5 to 6 specialists whose sole task was to predict, on the basis of weather data and other factors, the fallout pattern for each shot.

The Blast Prediction Unit manned 8 permanent and 4 mobile microbarograph stations. High explosives were detonated before the regular nuclear test, and the blast waves were measured in surrounding areas. These data were then scaled up to the expected blast from the nuclear detonation. Theoretical calculations of blast effects also were made on the basis of predicted meteorological conditions.

Representatives from the three prediction units briefed the advisory panel of experts each time a detonation was scheduled. The test shot was postponed if last-minute data indicated the prospect of significant fallout or blast damage for any inhabited area. A shot could be canceled at any time up to a few seconds before the scheduled detonation.

The innovation of detonating devices suspended from a balloon 1,500 feet above the ground during predawn hours created a new problem in public protection. To safeguard against possible temporary flash blindness caused by direct viewing of the device's fireball at detonation, and to avoid startling drivers, 6 to 9 roadblocks were established at appropriate places on public highways before each of the 5 high-balloon shots. Local officers and Nevada State Highway

Patrol troopers stopped motor vehicles at the roadblocks, and [illegible] mission personnel passed out instruction sheets and distributed [illegible] booklet entitled "Atomic Tests in Nevada."

The effectiveness of safety precautions is evidenced by the [illegible] of locality radiation exposures (see table I) and the absence of [illegible] structural damage in nearby occupied areas.

Of more than 9,000-participants in *Plumbbob*, only 18 [illegible] radiation exposure in excess of 5 roentgens. Highest exposure [illegible] 10.1 roentgens.[3]

National and Worldwide Monitoring System

The offsite monitoring program during weapons tests was a cooperative effort among the Commission, the U. S. Public Health Service, and the U. S. Weather Bureau. It provided maximum coverage of the country for measuring radioactivity levels resulting from weapons tests.

One system, a joint effort of the Commission and the Public Health Service, provided for monitoring 17 zones close to the test site. Each zone was the responsibility of a team which monitored its assigned territory, and provided liaison with people living within the zone. Mobile support teams at the test site were ready for service if needed in any of the zones.

The test organization had four additional monitoring programs.

One program provided data needed for monitoring radiation as far as 275 miles from the test site.

A second program used automatic measuring instruments placed in 29 communities around the test site and connected to headquarters by commercial telephone lines. By placing an ordinary telephone call, the control point could receive signals translatable in a matter of seconds into gamma-radiation dose rates.

In a third program, 17 automatic instruments located in areas adjacent to the test site made permanent records of gamma-dose rates continuously throughout the test series.

The fourth program was carried out by aerial surveys with special gamma-detection instruments.

Measurements remote from the test area were made by 38 Public Health Service monitoring stations, and 12 Commission installations. Gummed-paper collections of fallout were made by 92 Weather Bureau stations within the United States, and also at 74 locations

[3] The recommendations of the National Committee on Radiation Protection and Measurement for exposures in radiation controlled areas are: "The maximum permissible accumulated dose, in rems, at any age, is equal to 5 times the number of years beyond age 18, provided no annual increment exceeds 15 rems." A *rem* is a unit of radiation measurement for biological effects roughly equivalent to the effect caused by one roentgen of X-rays.

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outside the United States through arrangements with the Department of State, Weather Bureau, U. S. Air Force, and U. S. Navy. The list of collection stations is in Appendix 11.

Fallout Measurements in Test Site Area

The Commission reports in this section the highest levels of radiation exposure from external gamma radiation, from airborne radioactivity, and from radioactivity in water, expected to accrue as a result of fallout from *Plumbbob* tests.

External gamma radiation. Before Operation *Plumbbob* began, the Commission established a standard level for total accrued external radiation exposures resulting from test fallout, including *Plumbbob*, that would be considered acceptable for localities near the test site. The *Plumbbob* guide level of 3.9 roentgens was not exceeded at any monitored station; at two, estimated doses were over 3 *r*, and at two over 2 *r*. Most of the localities showed estimated dosages far below even the operational guide established, as shown in Table I on the following pages. In this table, the Commission gives the best estimates of the levels that may eventually accrue as a result of Operation *Plumbbob*.

The table expresses exposures in terms of "estimated dose" because the entire radiation exposure from fallout does not occur instantaneously, but accumulates for many weeks and months during which the radioactivity of the fallout materials gradually decays. It will be necessary to record the radiation levels for longer periods of time to make final estimates, but the final totals would not be expected to differ markedly from the estimates based on current data.

The table also reports estimated total exposures accumulated in the localities cited for all nuclear tests held at the Nevada Test Site, including the Plumbbob series.

Airborne radioactivity. To evaluate the radiation doses to the lungs from inhalation of concentrations of radioactive fallout materials in the air, the Commission estimated not only the amount of activity in the air and the duration of exposure in each locality but also the lapse of time after a detonation. Measurements and calculations of possible radiation exposures to the lungs as a result of *Plumbbob* fallout showed that the highest total accumulated dose (recorded at Eureka, Nev., with a population of about 500) was less than that to be expected from breathing for a period of 2 weeks air which contained only the amount of radioactive materials that occurs naturally.

TABLE I.—PRELIMINARY ESTIMATES OF RADIATION EXPOSURES IN LOCALITIES
ESTIMATED DOSES

COMMUNITY	POPULATION	EXTERNAL GAMMA RADIATION PLUMBBOB	CUMULATIVE FOR [illegible]
		(*Roentgens*)	(*Roentgens*)
ARIZONA:			
Beaver Dam Lodge (near Littlefield)	6	0.21	
Littlefield	44	.25	
Mount Trumbull	30	[2] 0	
Short Creek	90	0	
Wolf Hole	10	0	
CALIFORNIA: Quincy	1,330	.10	
NEVADA:			
A & B Mine (SW. of M & M Mine)	4		
Acoma (23 miles SE. of Caliente)	16	.10	
Alamo	250	0	
Apex	15	.02	
Ash Springs	5	0	
Austin	520	.01	
Baker	60	.14	
Barclay (22 miles SE. of Caliente)	38	.10	
Bardoli Ranch (8 miles E. of Nyala)	4	0	
Basalt	5	.28	
Beatty	550	.17	
Belew Ranch (old Adaven Post Office)	3	.10	
Belmont	6	.30	
Buckhorn Ranch	12	.70	
Bunkerville	250	.04	
Butler Ranch (30 miles S. of Alamo)	2	0	
Caliente	970	3.22	
Carp (35 miles S. of Caliente)	Variable to 25	0	
Charleston Lodge	60	.20	
Clarke's Station (32 miles E. of Tonopah)	Variable 0 to 5	0	
Coaldale	25	0	
Crestline	22	.45	
Crystal	5	0	
Crystal Springs	5	0	
Currant	75	.08	
Dodge Construction Co	175	.27	
Dry Lake	20	2.20	
Duckwater	50	0	
East Ely	1,000	.02	
Eden Creek Ranch (64 miles SW. of Crystal Springs).	0	0	
El Dorado	3		
Elgin (transient railmen)	Variable 30 average.	.36	
Ely	3,558	.03	
Eureka	500	.43	
Fallini Ranch	15	.40	
Fallon	2,400	.78	
Fernly	418	.13	
Gault	0	.10	
Geyser Ranch	5	2.86	
Glendale	50 average	.37	
Goldfield	220	.08	
Goldpoint	10	.52	
Groom Mine	0	.17	
Hawthorne	1,861	.02	
Hiko	55	.12	
Hoya	8	.05	
Indian Springs	250	1.40	
Kimberly	120	.09	
Las Vegas	47,000	.05	
Lincoln Mine	250–500	0	
Lida	25	1.25	
Lockes	4	.19	
Logandale	300	.32	
Lund	250	.03	
Manhattan	42	.28	
M & M Mine (10 miles NW. of the Warm Springs on Highway 6).	2	.14	
Mesquite	590	2.34	
McGill	2,300	.08	
Millett (ranch)	5	.05	
Mina	450	.32	
Moapa area	175	.13	
Montgomery Pass	3	.07	
North Las Vegas	13,000	.15	
		0	

[1] Indicates relatively little fallout prior to Operation Plumbbob.
[2] Zero means no substantial fallout.

TABLE I.—PRELIMINAR

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NEVADA—Continued
Nyala
Overton
Pahrump
Panaca
Parmans Ranch (10 miles
Pioche
Preston
Rattlesnake maintenance
Reed
Reveille Mills (10 miles S
on Highway 6).
Round Mountain
Rox
Ruby Hill Mine
Ruth
Schurz
Sharps (Adaven)
Shoshone
Silver Peak
South Paw Mine (5 miles
Stone Cabin Ranch (23 m
Stonehouse Ranch (5 mile
Sunnyside
Tonopah
Uhaldi Ranch (1 mile S. o
Ursine
Walch Pine Creek Ranch
Warm Springs (on Highw
Warm Springs Ranch (4 r
UTAH:
Alton
Anderson Junction
Bear Valley Junction (Or
Beaver
Beryl Junction
Cedar City
Central
Enterprise
Garrison
Glendale
Gunlock
Hamilton Fort
Harrisburg Junction
Hurricane
Ivins
Kanab
Kanarraville
Leeds
Long Valley
Lund
Milford
Minersville
Modena
Mount Carmel
New Castle
New Harmony
Orderville
Panguitch
Paragonah
Parowan
Pintura
Rockville
St. George
Santa Clara
Shivwits
Springdale
Toquerville
Veyo
Virgin
Washington
Zane

EXPOSURES IN LOCALITIES

ION	EXTERNAL GAMMA RADIATION PLUMBBOB	CUMULATIVE FOR ALL TESTS
	(*Roentgens*)	(*Roentgens*)
	0.21	
	.25	
	0	
	0	
	0	
	.10	
	.10	
	0	
	.02	
	0	
	.01	
	.14	
	.10	
	0	
	.28	
	.17	
	.10	
	.30	
	.70	
	.04	
	0	
	3.22	
	0	
5	.20	
	0	
5	0	
	.45	
	0	
	0	
	.08	
	.27	
	2.20	
	0	
	.02	
	0	
	0	
	.36	
	.03	
	.43	
	.40	
	.78	
	.13	
	.10	
	2.86	
	.37	
	.08	
	.52	
	.17	
	.02	
	.12	
	.05	
	1.40	
	.09	
	.05	
	0	
	1.25	
	.19	
	.32	
	.03	
	.28	
	.14	
	2.34	
	.08	
	.05	
	.32	
	.13	
	.07	
	.15	
	0	

TABLE I.—PRELIMINARY ESTIMATES OF RADIATION EXPOSURES IN LOCALITIES, ESTIMATED DOSES—Continued

COMMUNITY	POPULATION	EXTERNAL GAMMA RADIATION PLUMBBOB	CUMULATIVE FOR ALL TESTS
		(*Roentgens*)	(*Roentgens*)
NEVADA—Continued			
Tonopah	6	0.17	1.87
Tybo	725	.01	.36
Overton	89	0	.20
Pahrump	500	.03	.68
Panaca	7	.78	.78
Parmans Ranch (10 miles S. of Belmont)	1,392	.03	.73
Pioche	60	.31	1.01
Preston	4	.24	.24
Rattlesnake maintenance station	0	0	4.00
Reed	4	3.40	3.40
Riverside Mills (10 miles SE. of the Warm Springs on Highway 6)	200	.17	.22
Round Mountain	13	.21	3.21
Ruth	50	.40	.40
Ruby Hill Mine	1,244	0	.50
Ruth	100	.13	.13
Schurz	25	0	1.20
Sharps (Adaven)	250	0	.70
Shoshone	7	.38	.38
Silver Peak	3	.41	.41
South Paw Mine (5 miles N. of Mount Irish)	8	.42	.42
Stone Cabin Ranch (23 miles E. of Tonopah)	4	1.27	1.27
Stonehouse Ranch (5 miles N. of Belmont)	26	.27	1.47
Sunnyside	1,375	.62	.62
Tonopah	5	.29	.29
Thalli Ranch (1 mile S. of Old Adaven Post Office)	25	0	.69
Tintic	4	.21	.21
Walch Pine Creek Ranch	55	.25	.75
Warm Springs (on Highway 6)	58	.04	1.04
Warm Springs Ranch (4 miles NW. of Moapa)	154	.02	.82
Utah	17	.4	1.60
Anderson Junction	15	0	.40
Bear Valley Junction (Orton Jct.)	1,685	0	.25
Beaver	8	.03	1.03
Beryl Junction	6,106	.12	.52
Cedar City	49	.30	.30
Central	800	.05	.75
Enterprise	125	.10	.80
Garrison	275	.06	1.26
Grandale	127	.24	2.24
Gunlock	26	.12	.72
Hamilton Fort	5	.11	.11
Harrisburg Junction	1,375	.08	4.28
Hurricane	75	.50	.50
Iron	1,900	0	1.60
Kanab	263	.47	1.67
Kanarraville	100	.54	3.54
Leeds	10	.01	.81
Deer Valley	75	0	.50
Lund	1,673	0	.10
Milford	593	0	.20
Minersville	100	.02	.52
Modena	125	.02	.87
Mount Carmel	115	.04	.64
New Castle	126	.04	1.24
New Harmony	371	.05	1.55
Newcastle	1,501	.36	.56
Newcastle	404	.01	.41
Paragonah	1,455	.01	.41
Parowan	50	.62	1.82
Pintura	125	.07	3.07
Rockville	5,000	.50	3.50
St George	319	.46	3.96
Santa Clara	95	.54	3.34
Shurtz	209	.05	2.65
Springdale	219	.17	2.17
Toquerville	100	.65	2.65
Tropic	135	.08	1.58
Virgin	435	.13	3.13
Washington	25	0	.30
Zane			

Radioactivity in water. The operational guide established by the Commission for Operation *Plumbbob* for concentrations of fallout activity in drinking water is 0.005 microcurie per milliliter of water estimated for 3 days after a detonation. This value is based on the very conservative assumption that a person would continue to use the contaminated water as a sole supply throughout his lifetime. Actually, replenishment of the water by natural processes would greatly dilute activity resulting from fallout.

It was difficult to calculate precisely all the measurements taken of activity in the water to 3 days after each detonation because after succeeding shots the measured activity actually represented fallout from more than one explosion. Collected data show that even the highest activity observed in a drinking water supply—at Falling Ranch, Nev., population about 15—probably was less than one one-hundredth of the 0.005 microcurie per milliliter established as the operational guide.

Damage Claims After Tests

As a result of the *Plumbbob* test series, one horse grazing on the bombing range received beta burns and was purchased for further study. Of 15 claims of damage received to date, 10 were denied. The claims were mostly for window breakage and minor structural damage. Four claims were for minor glass breakage in Carson City, Nev.

A man from Hiko, Nev., submitted claims for broken windows and for personal injury, medical fees, and lost time from work. The man, 73 years old, alleged that he twisted his neck as a reaction to one detonation and that illness persisted for several weeks thereafter.

Civil Effects Test Group

During Operation *Plumbbob*, the Civil Effects Test Group conducted its most extensive program of biomedical studies since the 1951 tests series at the Eniwetok Proving Ground. There were 58 projects connected with 21 nuclear detonations.

Civil effects technical and scientific investigations are directed toward accumulating data valuable for civil defense activities and concern the consequences of blast, thermal, neutron, and gamma radiation, and fallout on people, food, drink, conventional structures, shelters, utilities, transportation, and community services.

This year's program included a continuation of studies begun in earlier series, and initiated several new, long-range programs related to current problems and designed to furnish the basis for future laboratory and field experiments.

Six general areas were studied: fallout radiation; prompt gamma and neutron radiation; blast effects on structures; blast biology; radiological countermeasures and training; and instrumentation of weapons effects.

Fallout radiation. A group of studies continued work begun on radioactive fallout from the first atomic test, the Trinity detonation in 1945 at Alamogordo, N. Mex. During *Plumbbob*, new methods were used to obtain data on biological accumulations of fallout; physical and chemical characteristics of the fallout particles; the delineation contours of radioactivity levels in the fallout area; and the interaction of fallout with agricultural products. Information developed by this program will help scientists in defining the limits of environmental radiation which may be safely tolerated. It will assist with efforts to devise methods for controlling takeup of fallout by plants, animals, and man. The data also aid in refining safety criteria for weapons tests.

Prompt gamma and neutron radiation. As part of a long-range program to chart the characteristics of bomb radiations and their effects on man, basic measurements were obtained on the distribution on the earth's surface of prompt gamma rays and neutrons from selected nuclear devices. Gamma intensities were measured with chemical dosimeters able to record gamma radiation selectively in the presence of neutrons. Neutron data were collected with detectors containing foils of fissionable materials. Angular paths and intensities of the two radiations from the point of detonation to various locations on the surface of the earth were measured by using specially designed water and lead collimators which allowed only radiations striking within a limited angle to register on the dosimeters.

Exploratory measurements were made of the protection against radiation provided by light frame houses and typical structural materials. The results, when complemented by theoretical and experimental work in the laboratory, are expected to give more accurate knowledge of radiation doses and shielding effects in various types of shelters and conventional structures.

Associated with physical measurements was a series of biomedical tests to determine the acute and chronic effects of massive doses of bomb radiations. Experimental animals were selected so as to provide an evaluation of the related response of various species, and a determination of the relationship between size and response. The experiment was designed to provide data that may be correlated with results from earlier tests.

This work is expected to lead to improved criteria for designing pro-

tective shelters, and to a better understanding of the effects of radia-
tion upon man. Specifically, it is designed to relate various physi-
logical effects with specific quantities of radiation, and to permit a
more accurate determination of the amount of radiation received by
various Japanese survivors of wartime bombings whose medical
histories have been documented by the Atomic Bomb Casualty
Commission.

Blast effects on structures. Tests sponsored principally by the Federal
Civil Defense Administration were made to determine blast effects
on a newly designed family shelter, a shelter designed to serve as an
underground garage which also would provide a refuge for a large
number of persons, and a dome shelter of reinforced concrete. Anti-
blast valves, components of a shelter ventilating system, were tested
in one event.

With industry cooperation and funding under FCDA sponsorship,
blast studies were made of the response of a protective vault for
records and valuables and a modular, reinforced-brick, windowless
structure. Also through FDCA sponsorship, the first tests were
conducted for allies of the United States. Three French and nine
German personnel shelters were tested in projects financed by France
and the Federal Republic of Germany. Results of these tests also will
be made available to the United States.

Blast biology. Work on the biological effects of blast upon man
continued in previous weapons tests and in the laboratory. Research
was directed toward the effects on biological systems of overpressure
from a blast wave, the characteristics and effects of debris and missiles
propelled by blasts, and the effects of blast-induced winds. In
addition to medical values, the studies are expected to provide guides
to improvements in designing protective shelters.

Radiological countermeasures and training. The Commission initiated
and financed a new project to determine whether a simple, inexpensive
shelter would provide adequate protection for personnel occupying
it at the time of a detonation, and also serve as a safe base from
which to organize and conduct operations in a fallout-contaminated
area. Preliminary evaluation indicates the structure will be useful.
Personnel for the project were provided from the staff of the Naval
Radiological Defense Laboratory, with assistance by personnel from
Commission laboratories, contractors, and FCDA.

The program included several radiological defense training exer-
cises, field testing of monitoring equipment and techniques, and
collection of data on radiological defense technology. Proof testing

was carried out in two aerial monitoring instruments developed by the Commission's Health and Safety Laboratory and used for aerial monitoring by civil defense personnel, some with the cooperation of the Civil Air Patrol which furnished aircraft and personnel. Approximately 125 radiological defense personnel from State and community civil defense organizations received training.

Instrumentation and supporting services. Necessary measurements of blast, heat, and nuclear radiation were made to meet the requirements of several programs.

An automatic radiation monitoring system by which readings of radiation intensities at various points near ground zero could be obtained by a telephone hookup was used in conjunction with radio communication with personnel to assist in early postdetonation recovery of instruments.

Fallout Studies

Studies continued during the 6-month reporting period to increase knowledge about the amount of fallout material from weapons tests in man's environment. Samples were collected through a program of worldwide sampling that includes food, soil, air, water, and human and animal bones. Specimens are analyzed particularly for the content of strontium 90, a product in fallout from atomic detonations which behaves much like calcium when taken into the body, being metabolized into the bones.

Additional programs were initiated to collect food and soil, and some expansion in the sampling of human materials is underway. Food samples have been obtained from Turkey and the Philippine Islands through the cooperation of the Interdepartmental Committee on Nutrition.

Expanded Food Collection Program

The foods program was expanded to include determining the strontium 90 content of foods comprising the major sources of calcium in Latin American diets. During July and August, arrangements were made to collect samples in Chile, Argentina, Peru, and Brazil of wheat, flour, potato, and green vegetable foods, which are being analyzed by the Commission's Health and Safety Laboratory, New York. Results will be made available to the participating countries.

A second food collection program was undertaken late this year in Venezuela, Bolivia, Ecuador, and Guatemala. Samples in these countries include primary calcium foods of more primitive populations

from areas where the soil has very low calcium content because of leaching by heavy rains. These results may help to define better the high end of the distribution curve of strontium 90 body burdens among the world population.

Soil Sampling Program—Resurvey

Since 1953, the Commission has sponsored a program of worldwide soil sampling and analysis under a cooperative arrangement with the U. S. Department of Agriculture. This program provides information on the amount of strontium 90 in soils, and the ratio of strontium to calcium which enters the food chain and ultimately finds its way into the skeleton. A Department of Agriculture representative will revisit the sites of earlier surveys to collect new samples in Europe, Africa, South America, Asia, Australia, New Zealand, and the British Isles.

A similar program in the United States this fall extended earlier sampling procedures. In addition to samples collected from sites previously surveyed, samples were taken at different latitudes with similar rainfall patterns. The results may help clarify the effect of latitude on deposition of fallout material.

Improved techniques for anlysis of soil, exchangeable calcium, and cesium 137 have been developed by the Health and Safety Laboratory.

Stratospheric Sampling Program

Collection of particulate material in the upper atmosphere was continued during the reporting period by use of equipment carried by balloons to heights of 50,000 to 90,000 feet. Nuclear Science & Engineering Corp. was awarded a contract for radiochemical analysis of the samples, and first results are being evaluated.

Publications on Fallout

After the hearings on "The Nature of Radioactive Fallout and Its Effects on Man" were held before the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy during May and June, the committee published the testimony, exhibits, and statements. The text is available in two volumes from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for $3.75 (Part One), and $2.75 (Part Two). A summary analysis of the hearings by committee staff is similarly available for 15 cents.

A statement on radioactive fallout submitted to the Commission in October by its Advisory Committee on Biology and Medicine was released and is reproduced in Appendix 13 of this report. Copies are available on request.

Strontium 90 in Soil, Diet, and Bone

Average levels of strontium 90 in the United States in the soil, in the diet, and in the skeleton have increased during the past year, consistent with the limits predicted for fallout from weapons already detonated.

The increase is due in part to continued fallout of material retained in the stratosphere since 1954, and in part to subsequent nuclear tests by this and other countries. The average concentration in milk from Perry, N. Y., during 1956, for example, was 3.3 micromicrocuries of strontium 90 per gram of calcium, with a maximum of 5.6 in November. The average for the first 7 months of 1957 was about 4 micromicrocuries of strontium 90 per gram of calcium.

The average concentrations in the skeletons of children in North America, based on samples of bone from 47 children in the age range from 0 to 9 years, was about 0.8 micromicrocurie of strontium 90 per gram of calcium, as compared to about 0.5 in earlier samples. The highest individual concentration observed among children was between 2 and 3 times the average. The worldwide average was slightly lower than that of the United States, with concentrations in South America less than half those in North America.

The National Research Council-National Academy of Sciences recommended a maximum level for general populations or children of 100 micromicrocuries of strontium 90 per gram of calcium.[4]

Revision of Radiation Standards

The Commission approved for application to all Commission operations a series of revised maximum permissible levels of radiation exposures which are based upon recent recommendations made by the National Committee on Radiation Protection and Measurement.[5] Most of the new standards are contained in a statement issued January 8 entitled, "Maximum Permissible Radiation Exposures to Man."[6] The committee's new recommendations will be included in the revision of several committee handbooks on radiation protection published by

[4] "Biological Effects of Atomic Radiation--Summary Reports," 1956.
[5] See appendix 10.
[6] See pp. 168–170 and 179–184, Twenty-first Semiannual Report (July–December 1956).

the National Bureau of Standards and used as guides in Commission activities.

In issuing its revised recommendations, which lower the permissible levels in some instances for both radiation workers and general population, the National Committee noted that the changes are not a result of any positive evidence of damage resulting from use of the earlier maximum permissible dose levels. Rather, the committee based its new recommendations on a desire to bring the maximum permissible dose into accord with the trend of scientific opinion, particularly with respect to possible genetic effects and to increasing concern over possible reduction in life expectancy resulting from radiation exposure. Because of expanding national and international uses of atomic energy, the committee suggested that its recommendations be put into effect within 5 years.

Under the new standards, permissible levels of exposure to external radiation for atomic energy workers are little affected. On yearly levels, the new standard provides that the total radiation dose which any individual worker may accumulate beyond the age of 18 shall average not more than 5 rems a year, and no dose of more than 15 rems shall be accumulated in any one year. An average dose of 15 rems a year was the maximum permissible exposure level under the previous standard. This yearly level has not often been reached except by a few persons exposed in radiation incidents. For the individual worker and for the average groups of workers, levels of radiation exposure have been kept well below even the lower levels set by the new standard.

Another basic revision occurs in the permissible radiation levels for internal emitters, radioactive substances that tend to get into and remain in the human body. In controlled areas, the maximum permissible concentrations in air and water of radioactive substances that tend either to be distributed evenly throughout the body or to be concentrated near the gonads has been reduced to one-third of the values previously specified for occupational exposures to such radioactive substances. The maximum permissible concentrations of radioactive substances that tend to be concentrated in single organs other than the gonads, such as strontium 90 in the bones, remain at the previously recommended levels.

In adopting the committee's recommendations, the Commission believes that because in the past its operators have followed conservative radiation protection policies, few contractors will find it necessary to make substantial adjustment in their operations. Such changes in present safety practices as are required will be made as soon as practicable. The Commission has traditionally adhered to the policy

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stated in National Bureau of Standards Handbook 59, "that exposure to radiation be kept at the lowest practicable level in all cases." The Commission is continuing this policy.

The Commission action does not affect the operations of Commission licensees. Radiation exposure standards for licensees are set in a Commission regulation (Title 10, Chapter 1, Code of Federal Regulations, Part 20, Standards for Protection against Radiation) which remains in effect. The Commission is currently preparing amendments to this regulation to make it consistent with the new recommendations.

For individuals outside of controlled areas, the maximum permissible concentration continues to be one-tenth of the recommended permissible exposures for radiation workers.

In addition to occupational exposure limits, the NCRPM made the following recommendation regarding exposures to the whole population:

> The maximum permissible dose to the gonads for the population of the United States as a whole from all sources of radiation, including medical and other manmade sources, and background, shall not exceed 14 million rems per million of population over the period from conception up to age 30, and one-third that amount in each decade thereafter. Averaging should be done for the population group in which crossbreeding may be expected.

The Commission is in accord with the philosophy expressed in this recommendation. The Commission exercises control over the exposures resulting from its own operations and those of its licensees, but does not control exposures which the public may receive from other sources of ionizing radiation. Therefore, the Commission has adopted the requirement that its industrial operations must not release any radiation which might be expected to expose members of the populace to an average whole body dosage exceeding 0.5 rem per year or an average concentration of radioactive material exceeding one-tenth of the maximum permissible concentrations for occupational exposure. This requirement will have the effect of limiting exposures to the public from Commission operations to one-tenth of the dosages allowed atomic energy workers.

This exposure limit for the public is in accord with a determination of the NCRPM that, if persons outside of controlled areas, but exposed to radiation from a controlled area, are assumed to receive yearly an average per capita dose of 0.5 rem, the total dose to the whole population from manmade radiations is not likely to exceed 10 million rems per million of population up to age 30.

Military Reactor Development

In the Commission's program of developing military reactors of various types for use by the armed services, tests continued during the reporting period on the Army Package Power Reactor, construction was advanced on Navy propulsion reactors, and Air Force experiments looking toward nuclear-powered flight went ahead.

Progress with civilian power reactors, and in advancing reactor and related technologies, are described in Chapter III of the preceding special section of this report, Part One, which deals with "Progress in Peaceful Uses of Atomic Energy."

Army Reactors

Army Package Power Reactor (APPR). After completion of construction and dedication during April, the Army Package Power Reactor at Fort Belvoir, Va., was put through a 700-hour performance test which was successfully concluded in July.

On July 24, a 6-month operating run was initiated. This run is intended to test reliability of plant operation over an extended period of time and to permit accumulation of operating data for planning field units of this type. Upon completion of these tests, called for under the original construction contract, the plant will be operated by Alco Products, Inc., under contract with the Government.

Concurrent research and development was directed toward plant improvement and the complete evaluation of performance characteristics. A new steam generator using bimetallic tubing, one not susceptible to chloride stress corrosion, was designed and ordered for evaluation.

Argonne Low Power Reactor. Twenty-seven percent of the construction of this unclassified reactor prototype had been completed as of the end of December. Completion of construction was scheduled early in 1958. Most Government-furnished items have been delivered to the site at the National Reactor Testing Station, Idaho, and the hazards summary report has been submitted.

Gas-Cooled Reactor Experiment (GCRE). Work on the Gas-Cooled Reactor Experiment proceeded on schedule during the reporting period: detailed design neared completion; a heat transfer loop experiment was put in operation at San Ramon, Calif., by the contractor, Aerojet General Nucleonics Corp.; site surveys resulting in the selec-

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tion of a site at the National Reactor Testing Station were completed; and procurement of long-lead items was initiated.

Other research and development activities included evaluation of an engineering mockup of the core; a critical experiment at Battelle Memorial Institute, Columbus, Ohio; materials testing; and advanced fuel element. An inpile reference test loop was placed in operation at Battelle. Related research and development activities consisted of efforts aimed at the design and fabrication of loops for the Oak Ridge Reactor (ORR), the Engineering Test Reactor (ETR), and a reactor at the Hanford Works.

Advanced reactor systems. Three firms were being considered to perform independent investigations of nuclear reactor concepts showing promise for use in military applications demanding a mobile powerplant with a moderate power rating, extreme compactness, and low operating weight. The work under each contract consists of a classified study to select a reactor concept, and the preparation of a preliminary design for an appropriate low power reactor experiment. A contract was negotiated with Consolidated Vultee Aircraft Corp. (Convair) for a survey of lightweight-shield development for such compact reactors.

Naval Reactors Program

As of the end of the reporting period, the Navy had awarded contracts for the nuclear reactor plants for the 18 nuclear-powered ships which the Congress has authorized through the fiscal year ending June 30, 1958. The 18 ships will incorporate 27 reactors. Sixteen ships are submarines (one to utilize two reactors), one is an aircraft carrier (to utilize eight reactors), and one a guided missile cruiser (two reactors). At the request of the Department of Defense, the Commission is procuring the reactor cores for these ships.

During this reporting period, the submarines, USS *Nautilus* and the USS *Seawolf*, continued to operate satisfactorily. A third nuclear powered submarine, USS *Skate*, SSN578, successfully completed her initial sea trials. Construction progressed on prototype reactor plants for a large radar picket submarine, a small submarine and a large naval surface ship. The Commission continued research and development work on other naval nuclear propulsion plants for submarine and surface ship application.

Submarine Thermal Reactor (S1W/S2W). The Naval Reactor Facility (S1W) plant continued to operate for scheduled testing and training

purposes until October. In November the plant was shut down for refueling.

The USS *Nautilus* (SSN571) (S2W) returned to New London from the Pacific in July. During September the *Nautilus* traveled under the Arctic ice to a latitude of 87° North. No ship has ever been so far north. During 5½ days under the ice, the *Nautilus* steamed over 1,000 miles. No submarine is known ever to have gone more than 20 miles under ice before.

Immediately after reaching the open sea, the *Nautilus* headed for NATO exercises. During these exercises she made her longest submerged run, steaming 5,007 miles in 332 hours at an average speed of 15 knots. The *Nautilus* has now steamed some 100,000 miles and was fully submerged more than half this distance.

Submarine Intermediate Reactor (S2G). The USS *Seawolf* (SSN575), powered by the S2G sodium-cooled nuclear propulsion plant, had steamed at the end of December more than 29,000 miles, over 20,000 submerged.

Submarine Advanced Reactor (S3G). Construction of a land-based prototype nuclear propulsion plant for the Submarine Advanced Reactor (S3G) progressed at West Milton, N. Y. Major components continued to be installed in the section of submarine hull which will house the prototype reactor compartment and engine room. The radar picket submarine *Triton* (SSR(N)586), which is under construction at Groton, Conn., will utilize two S3G type of nuclear propulsion plant.

Small Submarine Reactor (S1C). Construction of the Small Submarine Reactor prototype propulsion plant continued at the Nuclear Engineering Laboratory of Combustion Engineering, Inc., at Windsor, Conn. Erection of the submarine hull which will house the prototype has been completed and installation of steam and reactor plant components is underway.

An S1C type of nuclear propulsion plant will be installed in a small submarine authorized by Congress in the Navy's fiscal year 1958 shipbuilding program.

Large ship reactor (A1W). Construction of the A1W land-based prototype two reactor plant of a large ship reactor continued at the National Reactor Testing Station. An aircraft carrier utilizing eight A1W type of nuclear propulsion plant units has been authorized for construction.

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High speed submarine project (S5W). Research and development continued at the Commission's Bettis Plant on a nuclear propulsion plant suitable for installation in high speed attack submarines and guided missile launching submarines. This type of nuclear propulsion plant, designated S5W, will be installed in 10 nuclear powered submarines authorized by Congress through Fiscal Year 1958.

Guided missile cruiser project (C1W). Design and development work continued at the Commission's Bettis Plant on a nuclear propulsion plant for the guided missile cruiser, USS *Long Beach* CG(N)9. The keel of the USS *Long Beach* was laid on December 2, 1957, at the Fore River Shipyard of the Bethlehem Steel Co., Quincy, Mass.

Destroyer reactor (D1G). Design and development work continued at the Knolls Atomic Power Laboratory on development of a pressurized water nuclear propulsion reactor for use in a destroyer type of naval ship. The Shipbuilding Division, Bethlehem Steel Co., under contract with KAPL, continued work on the propulsion plant design and machinery arrangements.

Aircraft Reactors Program

The Commission and the Air Force have created an integrated joint Commission-U. S. Air Force project office to manage their joint program leading to the application of nuclear power for the propulsion of aircraft and missiles. The office will have complete executive management responsibility for all aspects of the nuclear propulsion system for manned aircraft as well as for reactors for nuclear missile propulsion and auxiliary nuclear power units.

This arrangement is designed to eliminate areas of coordination required previously, and to expedite communications between the operating contractors and the project director. The office is located in the headquarters of the Commission and is staffed by the Commission, the Air Force, and the Navy, under Maj. Gen. D. J. Keirn, USAF, who is project director within the Commission and the U. S. Air Force. General Keirn continues in his assignment as chief of the Aircraft Reactors Branch in the Commission's Division of Reactor Development, and as assistant deputy chief of staff for Development for Nuclear Systems of the Air Force.

National Reactor Station activities. Experiments connected with testing of reactors in relation to the nuclear operation of turbojet engines continued at the National Reactor Testing Station, performed by General Electric Co., contractor.

Construction of the *Low Power Test Facility* continued at the testing station and was expected to be completed early in 1958.

An expansion is in progress in the assembly and maintenance areas at the station, mainly shop facilities. This work includes some modification to existing buildings, as well as some new construction.

Construction of the *Flight Engine Test Facility* was started and is scheduled for completion late in 1959.

Connecticut Aircraft Nuclear Engine Laboratory (CANEL). Portions of research and small-scale component development facilities were completed and are currently in use at the Connecticut Aircraft Nuclear Engine Laboratory. The presently programed plant is to be completed next year. Realinement of responsibilities between the Commission and the Air Force has placed this work under a Commission contract with Pratt & Whitney Aircraft Division, United Aircraft Corp.

Nuclear-powered rockets and ramjet engines. Feasibility studies which the Commission has initiated relative to applying nuclear power to rockets and ramjet engines were continued at Los Alamos Scientific Laboratory, and at the University of California Radiation Laboratory at Livermore.

Community Operations

Sale of Property, Oak Ridge and Richland

Sales of real estate by the Housing and Home Finance Agency at *Oak Ridge*, Tenn., begun in July 1956, continued during the last half of 1957 at a satisfactory rate. All single-family houses, all but 100 of the duplexes, and a major portion of the commercial properties have been sold. Some of the larger parcels of vacant land were placed on the market in December, and apartments and dormitories will be offered for sale during the coming year.

At *Richland*, Wash., response to the sales program which began when residential lots were offered for sale on March 21 has been favorable. The rate of sales has been increasing rapidly.

Sales at both communities as of December 31 are summarized as follows:

	Oak Ridge		*Richland*	
	Number offered	*Percent sold*	*Number offered*	*Percent sold*
Single and duplex houses	4,360	98	2,220	43
Residential lots	1,422	20	228	19
Commercial properties	102	68	------	------

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Under recent amendments to the Atomic Energy Community Act of 1955, lessees of commercial property in Commission towns are permitted to apply for adjustments in their lease terms on a plea of undue hardship or inequity, and the Commission has established procedures for renegotiation of leases on commercial property. Twenty-one applications are being reviewed at Oak Ridge, and 95 lessees at Richland have requested adjustment.

Self-Government, Oak Ridge and Richland

In July members of the Oak Ridge Town Council met with the Richland Town Council to discuss problems common to both communities, and additional meetings were planned.

The Public Administration Service was engaged to conduct a fiscal and organizational survey of the government of Oak Ridge, similar to one that it performed at Richland last year. The Oak Ridge Town Council helped develop the scope of the proposed survey and the Midwest Research Institute, Kansas City, Mo., was retained to make a similar study of industrial potential.

The Richland Town Council undertook studies of the problems posed by incorporation as indicated by the survey. The council decided to engage a private firm to draft ordinances and regulations to be considered by the municipality.

Los Alamos Activities

The replacement of substandard housing units at Los Alamos which began in the spring of 1956 was completed during the reporting period.

The Commission approved a long-range, land-use plan for Los Alamos and, subject to availability of funds, authorized a start on developing the Barranca Mesa project, north of the town, for building sites for privately owned homes. The initial project would consist of 72 lots.

New Headquarters

The new headquarters building of the Commission, into which the Washington staff will move in January, was dedicated by the President on November 8 before an audience of some 3,000 persons. Besides the five Commissioners, the guests at the dedication ceremony included Members of Congress; Managers of Commission field offices, directors of Commission laboratories, and headquarters staff and their families; officials of the Federal, Maryland State, and local governments; representatives of foreign governments with whom the United

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Dedication. The President lays the cornerstone, with Lewis L. Strauss, Commission Chairman (right), and on Mr. Strauss' right, Representative Carl T. Durham, Chairman, Joint Committee on Atomic Energy

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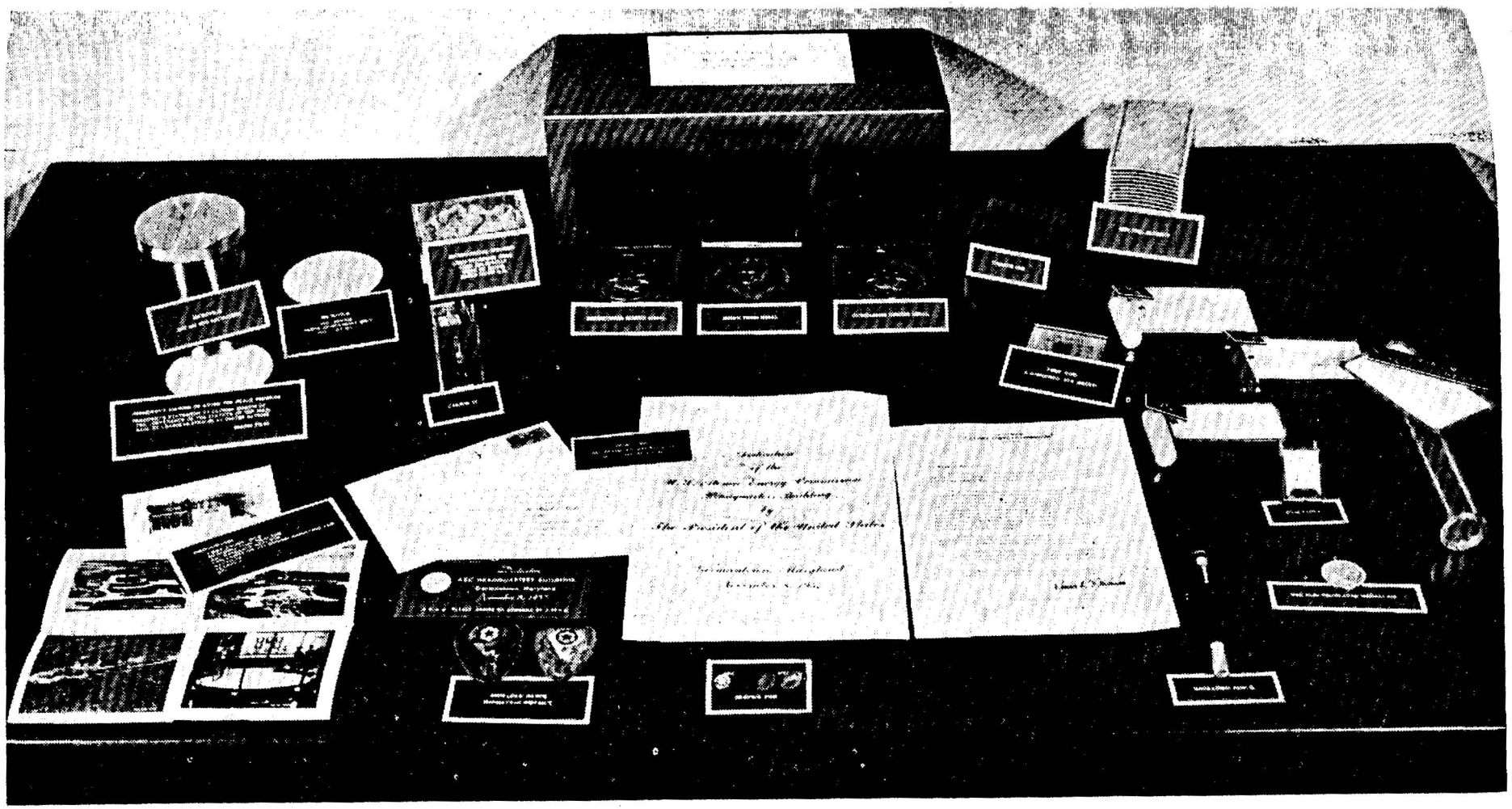

Cornerstone. The contents of the cornerstone.

States has atomic energy agreements; and representatives of industry, labor, and professional and scientific societies.

In his short dedicatory remarks, the President said, "I am praying that if this convocation here today could have one wish, it would be that the curse of the atomic explosion may pass from man's knowledge and only the good that results from this great discovery would be with us always."

Earlier he referred to the good and wicked sides of many of man's inventions. "What differentiates it [atomic energy] from all others," the President said, "is the terrible possibilities it opens to wicked men, people who want to use this new discovery for the destruction of mankind now have placed in their hands a power that certainly should give all of us pause. It should awaken man's conscience and appeal to his common sense. Because not only does it bring a sudden possibility of self-destruction but on the other side of that same coin again we have new possibilities for good—the production of power where no power was possible or was known, its usefulness in agriculture, in medicine, biology—everything we can think of * * *. Man's judgment and intelligence must measure up quickly to his inventive genius or mankind's future is bleak indeed."[7]

The President pressed a button, actuating a mechanism powered with batteries charged by eight nuclear power reactors, which uncovered a plaque for the lobby of the building.

The President; Lewis L. Strauss, Chairman of the Commission; and Carl T. Durham, Chairman of the Joint Committee on Atomic Energy of the Congress, joined in the ceremonial laying of the cornerstone, using three engraved silver trowels.

Before the President spoke, Chairman Strauss welcomed the guests and referred to the contents of the sealed box placed in the cornerstone.

"Into this cornerstone," the Chairman said, "go the more important documents tracing the first 15 years of man's control of atomic energy, samples of various nuclear materials and isotopes, and linen wrappings from the Dead Sea Scrolls whose age has been determined by one of the unexpected applications of atomic energy. I refer, of course, to the technique of radiocarbon dating originated by one of our colleagues, Commissioner Libby. And finally, this cornerstone will preserve for future time a record in picture and sound of the most inspiring of the many historic developments that have occurred during the 15 years since controlled atomic fission was achieved—President Eisenhower's memorable 'Atoms for Peace' address of December 8, 1953—a pronouncement which for men and women the world over

[7] Text of the President's remarks, and those of the Chairman, the contents of the program, and a list of contents of the cornerstone box are given in appendix 12.

transformed the atom from an unrelieved symbol of fear and terror to a promise of great blessing."

The microfilmed records included a complete set of semiannual reports to the Congress, Nos. 1 through 22, dated from January 1947 through July 1957.

After the dedication ceremony guests toured wings A, B, and C of the headquarters building, and viewed the mobile "Atoms for Peace" exhibit, brought to the site for the occasion.

Construction of the basic facilities of the new headquarters, contracted for in May 1956, was completed in December.

Public Law 85–107, approved July 17, 1957, authorized construction of an addition to the headquarters building, including a new wing and enlarged service facilities. The new wing—4 stories plus a ground floor—will extend southward, and add about 116,000 gross square feet to the approximately 400,000 square feet contained in the present building. Its completion is scheduled for the fall of 1958.

Nuclear Materials Management

Plans for providing uranium isotopic standards through the joint efforts of the Commission and the National Bureau of Standards, Department of Commerce, are progressing satisfactorily. Materials of very high isotopic purity, known as primary generative materials, have been transferred to the Bureau. These materials will provide the basis for the values on which certified uranium isotopic standards ultimately will be issued. Pending preparation of these standards, arrangements have been made to issue a series of 14 isotopic standards having provisional values.

A set of approved measurement methods is being developed for source and special nuclear materials. These methods are expected to be useful both for routine measurement applications by Commission contractors and licensees, and for umpiring differences in measurements on quantities of materials transferred.

Inspection

Contractor and Direct Commission Activities

At the end of the fiscal year, June 30, 1957, the Director, Division of Inspection, submitted the first annual certification to the General Manager on the adequacy of inspections of Commission and contractor activities to support findings as to the state of compliance with regu-